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## Field pea (*Pisum sativum*) varieties: Shelf life evaluation and product development

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### Abstract

Legumes are dicotyledonous seeds of plants that belong to the family Leguminosae. Field pea (*Pisum sativum* L.)-which is also known as common pea, dry pea, green pea (green seeded cultivars), yellow pea (yellow seeded cultivars), and garden pea-is a cool season crop, grown in the sub-tropics and at higher altitudes in the tropics. It is one of the four important cultivated legumes (others include soy-beans, groundnuts and dry-beans) in the world. Peas have long been recognised as an inexpensive, readily available source of protein, complex carbohydrates, vitamins and minerals. The high nutrient density of peas makes them a valuable food commodity, capable of meeting the dietary needs of the estimated 800-900 million undernourished individuals worldwide. So keeping in view the benefits of field pea present study was undertaken for shelf life evaluation and product development from improved varieties of field pea. The improved varieties (Pant P-13, Pant P-14, Pant P-25, Pant P-42 and Pant P-74) were obtained from CRC (Crop Research Centre), Pantnagar. Bengal gram flour and other ingredients were procured from the local market of Pantnagar, US Nagar, Uttarakhand. Standard procedures were used for shelf life analysis and product development. Results of Storage study showed that with increase in storage period moisture content and total plate count increases. From sensory evaluation it was found that there was non-significant difference in organoleptic characteristics of control (Besan) and Pant Pea-13 flour Dhokla. Nutrient composition of Pant Pea-13 flour dhokla revealed that it contained higher amount of protein (20.43%), carbohydrates (61.57%) and iron (6.65mg/100g) content than that of control dhokla.

**Keywords:** Field pea, dhokla, shelf life, product development, organoleptic

### Introduction

Legumes are the edible fruits or seeds of pod-bearing plants belonging to the family Leguminosae and are widely cultivated throughout the world (Kaur, Sandhu, & Singh, 2007)<sup>[9]</sup>. Yellow field pea is an important grain legume, both as human food and animal feed (Koyoro & Powers, 1987; Sun & Arntfield, 2010)<sup>[11, 14]</sup>.

The pea (*Pisum sativum*) is grown both for its dried seed and as a fresh vegetable. The mature grain crop is referred to as field pea, while the garden pea is cultivated for its immature green seeds and the sugar pea for its immature pods. Round seeded field pea is mainly used for human consumption and animal feed, while wrinkled seeded field pea is used for freezing and canning.

Field pea is an important cool-season pulse crop of mild climate regions that originated approximately 9000 years ago. Field pea originated in the Middle East (Syria, Iraq and Iran) and has been cultivated in Europe and North America for hundreds of years (Saskatchewan Pulse Growers, 2000)<sup>[13]</sup>. Presently it is cultivated over more than 10 million hectare worldwide and is a major pulse crop grown in Western Canada and mid- western regions of United States. In the Mediterranean region, field pea form an important component of the human diet.

Pea (*Pisum sativum* L.) is one of the most important food legumes in the world not only for its very old history of domestication but also for its versatile use as vegetables, pulses and feed. Its production ranks second amongst the cool season pulses in the world and the third largest area in pea cultivation is occupied by India after Canada and Russia (Khan and Dixit 2001)<sup>[10]</sup>. Peas are grown all over India and Indian sub-continent and consumed as green vegetable, chat (spicy dish), chhola (whole grain), dhal (pulses) and flour, thus, contributes significantly to market economy.

Field peas are rich in proteins (18 to 30%) (Kaur *et al.*, 2007)<sup>[9]</sup> and contain high levels of lysine which can be used to balance the deficiencies of this essential amino acid in cereal based diets (Chel *et al.*, 2007)<sup>[4]</sup>. Due to its high protein content it has been suggested as an alternative protein source to soybean in countries where the former legume is not a native crop, or in situations where soybean cannot be used due to allergic reactions or intolerances (Davidsson *et al.*, 2001)<sup>[5]</sup>.

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Field peas are rich in several mineral elements, vitamins and other nutrients and are characterized by a relatively high antioxidant activity (Han and Baik, 2008) [7]. The seeds are low in fat, high in fiber and contain no cholesterol. It has been suggested that high protein contents of pea is particularly important for countering protein malnutrition in the heavily cereal-based diets of the population of the Mediterranean region. They are known for a cholesterol-lowering effect (Martins *et al.*, 2004) [12].

Therefore the present study was undertaken with the objective of evaluation of shelf life and product development from improved varieties of field pea seed flour.

### Materials and Methods

The present study has been carried out in the Department of Foods and Nutrition, College of Home Science, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand.

#### Procurement of raw materials

Five improved varieties of Field pea (*Pisum sativum*) were obtained from CRC (Crop Research Centre), Pantnagar. The improved varieties studied were: Pant P-13, Pant P-14, Pant P-25, Pant P-42 and Pant P-74. The description of five field pea varieties under study are presented in Table 3.1. Bengal gram flour and other ingredients were procured from the local market of Pantnagar, US Nagar, Uttarakhand.

#### Preparation of sample

The samples of all the five field pea varieties were cleaned free from dust, dirt and the extraneous material and were stored in clean air tight glass jars. The whole grains samples were ground in a mixer grinder and then passed through a sieve. The flour was stored in air tight containers for further analysis.

#### Storage study

Total Viable Count (APHA 1984) [3] Total bacterial count of the samples was determined using Standard Plate Count (SPC) technique as given in compendium of methods for microbiological examination of foods (APHA, 1984) [3]. This technique gives total number of viable cells of bacteria present in the sample, therefore also called as total viable cell count (TVC) technique or serial dilution technique. The samples were analyzed in three replicates.

**Preparation for microbial analysis:** To carry out the analytical procedure for microbial analysis, following preparations were made:

**Sterilization of glasswares:** All glassware used in microbiological work was of Borosil make. Prior to start of experiment, the glasswares were sterilized in the hot air oven at 180°C for 2 hours.

**Preparation of peptone water:** For the analysis, peptone water was used for preparing dilutions. Peptone water was prepared by dissolving 0.1g of peptone and 0.5 g of NaCl in 100 ml distilled water (pH 7.2). After preparing solution, it was sterilized by autoclaving at 121 °C (15 lbs pressure) for 15 minutes and then cooled to 45 °C before use.

**Sample dilutions:** 10 g of sample was blended with sterilized 0.1 per cent peptone water and Volume was made up to 100 ml with the same solution. This constituted first dilution

(1:10). The suspension was then shaken thoroughly by hand shaking for 2 minutes and subsequent dilutions were made using sterilized 0.1 per cent peptone water. One ml of this suspension was aseptically transferred to 9.0 ml of sterilized 0.1 percent peptone water tube, thus making 10<sup>-2</sup> dilution (1:100). In the same fashion, dilutions of 10<sup>-3</sup>, 10<sup>-4</sup>, 10<sup>-5</sup> and 10<sup>-6</sup> were prepared.

**Plates:** Appropriate dilutions of the sample (1ml) were transferred aseptically to sterile petri plates in duplicate and mixed well with 10-15 ml of pre-sterilized plate count agar at 45 °C. After solidification plates were incubated at 37 °C for 48 hours in bacteriological incubator.

**Quantification of colonies:** On completion of incubation period, petri plates were taken out of the incubator and the colonies were counted using colony counter. The dilution plates showing the number of colonies in the statistical range of 30-300 were selected and average of the counts were determined. The total plate count per g or ml of the sample was calculated using formula given below:

$$\text{Cfu per g or ml of sample} = \frac{\text{Number of colonies} \times \text{Dilution factor}}{\text{Amount of sample taken}}$$

#### Moisture

Moisture content was determined as per AOAC (1995) [2] procedure. Two gram of sample was taken in a clean, dried (at 130±3 °C for 20 min) and weighed aluminum dish. The sample was dried in oven at 130±3 °C for 1 hour till a constant weight was obtained and cooled in desiccator. After cooling, the loss in weight was taken as moisture content and expressed in terms of percentage.

$$\text{Percent Moisture} = \frac{W_2 - W_3}{W_2 - W_1} \times 100$$

#### Where

W<sub>1</sub> = Weight of empty aluminum dish

W<sub>2</sub> = Weight of aluminum dish + sample before drying

W<sub>3</sub> = Weight of aluminum dish + sample after drying

**Product development:** Dhoklas were prepared using five improved varieties of field pea seed flour (100%) and was compared with Bengal gram flour (100%). On the basis of sensory characteristics, the best product was selected statistically and was analyzed for nutrient composition.

**Preparation of Dhokla:** Dhoklas were made using five varieties of field pea seed flour (100% each) and compared with Dhokla made with Bengal gram flour (100%) as given below. The quantity of other ingredients was kept constant.

A: 100% Bengal gram flour

B: 100% Pant P-13 flour

C: 100% Pant P-14 flour

D: 100% Pant P-25 flour

E: 100% Pant P-42 flour

F: 100% Pant P-74 flour

Ingredients	Quantity
Bengal gram flour/Varieties of Field pea seed flour	100 g
Buttermilk	110 ml
Water	50 ml
Green Chilli	4 g
Salt	16 g
Eno	2.5 g

## Method

- Weighed amount of Flour was taken in a deep Bowl and finely chopped green chillies were added to it.
- Then butter milk and water were added to flour and mixed. Lumps were avoided.
- Salt was added and mixed well.
- The steamer was heated and the moulds were greased.
- Finally eno was added to the batter and mixed well.
- The batter was poured into the greased moulds and moulds were placed in the steamer.
- Steamer was covered and steaming was done for 20-30 minutes. When a little cool, squares were cut and served.

## Sensory evaluation of Dhokla made from Bengal gram flour (100%) and five varieties of field pea seed flour (100%)

The prepared Dhoklas were evaluated for sensory characteristics using Nine Point Hedonic Scale and Sensory Score Card (Amerine *et al.*, 1965) [1] (Appendix I and II) by a panel consisting of 15 members from the Department of Foods and Nutrition, G.B. Pant University of Agriculture and Technology. The data obtained on sensory evaluation of dhoklas were further analyzed statistically.

## Nutritive value of best selected product

The nutritive value of best selected dhokla was calculated by using the data available in Nutritive value of Indian Foods by Gopalan *et al.*, (2011) [6]. The nutritive value of field pea seed flour was used from the result obtained in the present study. Energy, crude protein, crude fat, carbohydrates, physiological

energy, calcium and Iron were calculated.

## Statistical analysis

Two way ANOVA analysis was applied to find out the critical difference between the mean scores of storage studies of improved varieties of field pea seed flour and one way ANOVA analysis was applied to find out the critical difference between the mean scores of sensory evaluation.

## Results and Discussion

### Storage study of improved varieties of field pea seed flour

Field pea seed flour of five improved varieties was packed in HDPE bags separately and were stored for two months at room temperature (17°C- 24 °C). The flour were analyzed for moisture content and total viable count at intervals of 30 days. The results obtained were presented in Table 1 and 2 respectively.

### Total viable count

There was less than 30 colonies in improved varieties of field pea seed flour on 0 day of storage period. Microbial load increased with increasing time of storage. Microbial load in Pant Pea-13, Pant Pea-14, Pant Pea-25, Pant Pea-42 and Pant Pea-74 flour reaches up to  $1.76 \times 10^3$ ,  $1.66 \times 10^3$ ,  $1.26 \times 10^3$ ,  $1.53 \times 10^3$  and  $1.83 \times 10^3$  cfu/g respectively after 60 days of storage at room temperature. In general, the total viable count for wheat flour is reported as  $1 \times 10^6$  cfu/g of the sample and the total viable count should not exceed more than this value (ICMSF, 1998) [8]. The obtained values were found to be in acceptable range for total plate count of flour.

**Table 1:** Total plate count of improved varieties of field pea seed flour during the storage period

Total plate count (TPC) (cfu/g)	Storage period			
	Varieties	0 Day	30Days	60Days
Pant Pea-13	< 30	$1.24 \times 10^3$	$1.76 \times 10^3$	$0.99 \times 10^3$
Pant Pea-14	< 30	$1.46 \times 10^3$	$1.66 \times 10^3$	$1.04 \times 10^3$
Pant Pea-25	< 30	$1.05 \times 10^3$	$1.26 \times 10^3$	$0.77 \times 10^3$
Pant Pea-42	< 30	$1.14 \times 10^3$	$1.53 \times 10^3$	$0.89 \times 10^3$
Pant Pea-74	< 30	$1.34 \times 10^3$	$1.83 \times 10^3$	$1.05 \times 10^3$
<b>Mean</b>	<b>&lt; 30</b>	<b><math>1.24 \times 10^3</math></b>	<b><math>1.60 \times 10^3</math></b>	<b><math>0.95 \times 10^3</math></b>

Factors	S. Em.±	CD at 5%
Varieties (V)	8.83	25.52
Days (D)	6.84	19.76
VxD	15.30	44.20

S. Em-Standard error of mean, CD-Critical difference

## Moisture content

The moisture content of improved varieties of field pea seed flour increased with increasing time of storage at room temperature. The moisture content increased from 11.63% on the starting day of study to 12.95% after 60 days for Pant Pea-13, from 12.17% on the starting day of study to 12.80% after 60 days for Pant Pea-14, from 11.36% on the starting day of study to 12.52% after 60 days for Pant Pea-25, from 12.00% on the starting day of study to 12.78% after 60 days for Pant

Pea-42, from 11.95% on the starting day of study to 13.11% after 60 days for Pant Pea-74 at room temperature. There was significant difference in Pant Pea-13, Pant Pea-25 and Pant Pea-74 on their zero day, 30 days and 60 days in moisture content. The moisture content falls within the acceptable limit which is given by FSSAI i.e.  $\leq 14\%$  for wheat flour. It was observed that improved varieties of field pea seed flour packed in polyethylene pouches could be stored up to 2 months at room temperature safely.

**Table 2:** Moisture content of improved varieties of field pea seed flour during the storage period

Varieties	Moisture content (%) Storage period			
	0 Day	30 Days	60 Days	Mean
Pant Pea-13	$11.63 \pm 0.16^a$	$12.39 \pm 0.06^b$	$12.95 \pm 0.09^c$	12.32
Pant Pea-14	$12.17 \pm 0.30^a$	$12.61 \pm 0.08^b$	$12.80 \pm 0.17^b$	12.53
Pant Pea-25	$11.36 \pm 0.10^a$	$12.17 \pm 0.02^b$	$12.52 \pm 0.00^c$	12.02
Pant Pea-42	$12.00 \pm 0.25^a$	$12.76 \pm 0.45^b$	$12.78 \pm 0.06^b$	12.52
Pant Pea-74	$11.95 \pm 0.17^a$	$12.52 \pm 0.07^b$	$13.11 \pm 0.33^c$	12.52
<b>Mean</b>	<b>11.82</b>	<b>12.49</b>	<b>12.83</b>	<b>12.38</b>

All results are mean  $\pm$  standard deviation for three individual determinations. Means having different superscript differ significantly in each row ( $p < 0.05$ )

Factors	S. Em.±	CD at 5%
Varieties (V)	0.07	0.19
Days (D)	0.05	0.15
VxD	0.11	0.33

S. Em-Standard error of mean, CD- Critical difference.

**Sensory evaluation:** The sensory evaluation of dhokla was conducted using Nine Point Hedonic Scale and Score Card method by 15 semi trained panels from department of Foods and Nutrition, G.B. Pant University of Agriculture and Technology.

**Sensory evaluation of Dhokla using Nine Point Hedonic Scale:** The results of sensory evaluation of dhokla using Nine Point Hedonic Scale have been presented in Table 3.

**Table 3:** Sensory score of dhokla made from Bengal gram flour (control) and improved varieties of field pea seed flour using Nine Point Hedonic scale

Scale Product	Liked extremely	Liked very much	Liked moderately	Liked slightly	Neither like nor dislike	Disliked slightly
A (Control)	33.33%	46.67%	13.33%	6.67%		
B (Pant pea-13)	13.33%	46.67%	33.33%	6.67%		
C (Pant pea-14)	-	26.66%	46.67%	26.67%		
D (Pant pea-25)	6.67%	26.66%	33.33%	26.67%	6.67%	
E (Pant pea-42)	6.67%	6.67%	40%	33.32%	6.67%	6.67%
F (Pant pea-74)	6.66%		46.67%	40%		6.67%

Sensory evaluation of dhokla by Nine Point Hedonic Scale taking field pea seed flour of five improved varieties showed that dhokla prepared with Pant Pea-13 flour was liked extremely by 13.33 percent of the panel members, 46.67 percent of the panel members liked it very much, 33.33 percent of the evaluators liked it moderately and 6.67 percent of the panel members liked it slightly. Dhokla prepared with Pant Pea-14 flour was liked very much by 26.66 percent of the panel members, 46.67 percent of the members liked it moderately and 26.67 percent of the members liked it slightly. Dhokla prepared with Pant Pea-25 flour was liked extremely by 6.67 percent of the evaluators, 26.66 percent of the panel members liked it very much, 33.33 percent of the panel members liked it moderately, 26.67 percent of the evaluators liked it slightly and 6.67 percent of the members neither liked nor disliked the product. Dhokla prepared with Pant Pea-42 flour was liked extremely by 6.67 percent of the panel members, 6.67 percent of the members liked it very much, 40 percent of the panel members liked it moderately, 33.32 percent of the members liked it slightly, 6.67 percent of the members neither liked nor disliked the product and 6.67 percent members slightly disliked the product. Dhokla

prepared with Pant Pea-74 was liked extremely with 6.66 percent of the panel members, 46.67 percent of the panel members liked it moderately, 40 percent of the members liked it slightly and 6.67 percent of the panel members slightly disliked the product. Control dhokla was liked extremely by 33.33 percent of the panel members, 46.67 percent of the panel members liked it very much, 13.33 percent of the panel members liked it moderately and 6.67 percent of the members liked it slightly.

**Sensory score of dhokla made from Bengal gram flour (control) and improved varieties of field pea seed flour using score card method:** The prepared dhoklas were further evaluated for their sensory quality using Score Card method. Analysis of variance (ANOVA) was applied to ascertain the difference in sensory parameters among improved varieties of field pea seed flour dhokla with the control dhokla which was prepared from Bengal gram flour. Difference among individual means were tested using least significant difference test (LSD) at  $P < 0.05$  level. The results have been presented in Table 4.

**Table 4:** Sensory score of dhokla made from Bengal gram flour (control) and improved varieties of field pea seed flour using Score Card method

Product Attributes	Control	Pant pea-13	Pant pea-14	Pant pea-25	Pant pea-42	Pant pea-74	S. Em±	CD at 5%
Taste	8.20±0.94 <sup>a</sup>	7.87±0.64 <sup>a</sup>	7.43±0.73 <sup>b</sup>	7.23±0.90 <sup>c</sup>	6.93±1.03 <sup>d</sup>	6.53±0.92 <sup>e</sup>	0.225	0.632
Colour and appearance	8.53±0.64 <sup>a</sup>	8.17±0.36 <sup>a</sup>	8.17±0.52 <sup>a</sup>	7.60±0.51 <sup>b</sup>	7.73±0.59 <sup>c</sup>	7.67±0.82 <sup>d</sup>	0.152	0.429
Sponginess	8.20±0.68 <sup>a</sup>	7.53±0.99 <sup>a</sup>	7.67±0.98 <sup>a</sup>	7.50±.63 <sup>a</sup>	7.47±0.99 <sup>a</sup>	7.27±.96 <sup>a</sup>	0.228	0.642
Flavour	8.10±0.93 <sup>a</sup>	7.83±0.88 <sup>a</sup>	7.30±0.80 <sup>b</sup>	7.13±0.83 <sup>c</sup>	6.87±0.83 <sup>d</sup>	6.67±0.82 <sup>e</sup>	0.219	0.617
Overall Acceptability	8.20±0.77 <sup>a</sup>	7.73±0.73 <sup>a</sup>	7.23±0.68 <sup>b</sup>	7.20±0.86 <sup>c</sup>	6.93±0.80 <sup>d</sup>	6.53±0.74 <sup>e</sup>	0.198	0.556

Means having different superscripts differ significantly in each row ( $p \leq 0.05$ )

S. Em-Standard error of mean, CD-Critical difference

**Colour and appearance:** Evaluation of colour and appearance of dhokla made from improved varieties of field pea seed flour showed that dhokla prepared individually with Pant Pea-13 and Pant Pea-14 flour obtained a mean score of 8.17. Dhokla prepared with Pant Pea-42 obtained a mean score of 7.73. Dhokla prepared with Pant Pea-74 obtained a mean score of 7.67. Dhokla prepared with Pant Pea-25 obtained a mean score of 7.60. Control dhokla containing Bengal gram flour obtained a mean score of 8.53. Statistical analysis of data showed that Control, Pant Pea-13, Pant Pea-

14 flour dhokla differed significantly in colour and appearance from Pant Pea-25, Pant Pea-42 and Pant Pea-74 flour dhokla.

**Taste:** Evaluation of taste of dhokla made from improved varieties of field pea seed flour showed that dhokla prepared with Pant pea-13 flour obtained a mean score of 7.87. Dhokla prepared with Pant Pea-14 flour obtained a mean score of 7.43. Dhokla prepared with Pant Pea-25 flour obtained a mean score of 7.23. Dhokla prepared with Pant Pea-42 flour

obtained a mean score of 6.93. Dhokla prepared with Pant Pea-74 flour obtained a mean score of 6.53. Control dhokla containing Bengal gram flour obtained a mean score of 8.20. Statistical analysis of data showed that there is non-significant difference in taste between dhokla prepared with Bengal gram flour (control) and Pant Pea-13 flour.

**Sponginess:** Evaluation of sponginess of dhokla made from improved varieties of field pea seed flour showed that dhokla prepared with Pant Pea-14 flour obtained a mean score of 7.67. Dhokla prepared with Pant Pea-13 flour obtained a mean score of 7.53. Dhokla prepared with Pant Pea-25 flour obtained a mean score of 7.50. Dhokla prepared with Pant Pea-42 flour obtained a mean score of 7.47. Dhokla prepared with Pant Pea-74 flour obtained a mean score of 7.27. Control dhokla containing Bengal gram flour obtained a mean score of 8.20. Statistical analysis of data showed that there is non-significant difference in sponginess between all the improved varieties of field pea seed flour dhokla.

**Flavour:** Evaluation of flavour of dhokla made from improved varieties of field pea seed flour showed that dhokla prepared with Pant Pea-13 flour obtained a mean score of 7.83. Dhokla prepared with Pant Pea-14 flour obtained a mean score of 7.30. Dhokla prepared with Pant Pea-25 flour obtained a mean score of 7.13. Dhokla prepared with Pant Pea-42 flour obtained a mean score of 6.87. Dhokla prepared with Pant Pea-74 flour obtained a mean score of 6.67. Control dhokla containing Bengal gram flour obtained a mean score of 8.10. Statistical analysis showed that Control and Pant Pea-13 flour dhokla differed significantly in flavour from Pant

Pea-14, Pant Pea-25, Pant Pea-42 and Pant Pea-74 flour dhokla.

**Overall acceptability:** Evaluation of overall acceptability of dhokla made from improved varieties of field pea seed flour showed that dhokla prepared with Pant Pea-13 flour obtained a mean score of 7.73. Dhokla prepared with Pant Pea-14 flour obtained a mean score of 7.23. Dhokla prepared with Pant Pea-25 flour obtained a mean score of 7.20. Dhokla prepared with Pant Pea-42 flour obtained a mean score of 6.93. Dhokla prepared with Pant Pea-74 flour obtained a mean score of 6.53. Control dhokla containing Bengal gram flour obtained a mean score of 8.20. Statistical analysis showed that Control and Pant Pea-13 flour dhokla differed significantly in overall acceptability from Pant Pea-14, Pant Pea-25, Pant Pea-42 and Pant Pea-74 flour dhokla.

**Nutritive value of control and best selected dhokla (Pant Pea-13 flour dhokla):** On the basis of sensory evaluation it was found that there was non-significant difference between dhokla prepared from Bengal gram flour (Control) and Pant Pea-13 flour. So Pant Pea-13 flour dhokla was selected as best product and its nutritive value was calculated by using data from the present study for Pant Pea-13 flour and of other ingredients from Nutritive value of Indian Foods by Gopalan *et al.*, (2011) [6]. The nutritive value of dhokla made from Bengal gram flour was calculated by using the data available in Nutritive value of Indian Foods by Gopalan *et al.*, (2011) [6]. Results of nutritive value of control and Pant Pea-13 flour dhokla have been presented in Table 5.

**Table 5:** Nutritive value of Control and Pant Pea-13 flour dhokla per 100g

Products	Protein(g)	Fat(g)	Carbohydrates(g)	Energy(kcal)	Calcium(mg)	Iron(mg)
Control (Bengal gram flour)	18.09	6.53	61.21	378	236.2	4.89
Pant Pea-13 flour	20.43	2.30	61.57	347	118.53	6.65

Nutritive value of dhokla prepared from Bengal gram flour i.e. control and Pant Pea-13 flour showed that protein, carbohydrates and iron content of Pant Pea-13 flour dhokla were higher than that of dhokla prepared from Bengal gram flour while fat, energy and calcium content were higher in dhokla prepared from Bengal gram flour.

### Conclusion

From the present study it was concluded that field pea flour can be stored up to 2 months at room temperature. Varieties of field pea seed flour can be successfully used in preparation of dhoklas and among the five varieties Pant Pea-13 flour dhokla contained higher amount of protein (20.43%), carbohydrates (61.57%) and iron (6.65mg/100g) content than that of control (Bengal gram flour) dhokla.

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## Appendices

### APPENDIX-I

**Name:**

**Date:**

**Product:**

**Hedonic scale:** Taste the given sample which are presented before you as sample A, B, C, D, E and F respectively. Check how much you liked or disliked them.

Hedonic scale	Product Code					
	A	B	C	D	E	F
Liked extremely						
Liked very much						
Liked moderately						
Liked slightly						
Neither liked nor disliked						
Disliked slightly						
Disliked moderately						
Disliked very much						
Disliked extremely						

Comments

Signature

### APPENDIX-II

**Name:**

**Date:**

**Product:**

**Score card:** Taste the given sample which are presented before you as sample A, B, C, D, E and F respectively. Check how much you liked or disliked them.

**Scoring scale:** 1-2 Very poor, 3-4 Poor, 5-6 Fair, 7-8 Good, 9-10 Very good

Product code	Taste	Colour and appearance	Sponginess	Flavour	Overall Acceptability
Maximum score	10	10	10	10	10
A					
B					
C					
D					
E					
F					

Comments

Signature